

NYASALAND PROTECTORATE



Annual Report
of the
Department of Agriculture
1940

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STAFF LIST.

Department of Agriculture

Director	...	A. S. RICHARDSON, B.Sc. (Edin.) (Appointed 9/6/40).
Assistant Director and Chemist	}	A. J. W. HORNBY, M.B.E., B.Sc., A.I.C. (Acting Director 20/12/39—8/6/40. Seconded to the Mozambique Government 7/7/40).
Entomologist	...	C. SMEE, M.C., D.I.C., A.R.C.S., F.R.E.S. (Acting Assistant Director 8/7/40).
Assistant Chemist	...	I. W. M. ARMSTRONG BLACK, B.Sc., PH.D., A.I.C.T.A.
Marketing Officer	...	C. B. GARNETT, M.A. (Cantab.). (Seconded from Tanganyika Territory 24/6/40).
Agricultural Officers	...	F. BARKER, DIP. AGRIC. (Edin.). (Proceeded on leave, pending retirement 16/3/40).
		E. LAWRENCE, N.D.A., C.D.A.
		R. W. KETTLEWELL, B.Sc., A.I.C.T.A. (On active service 30/5/40).
		A. P. S. FORBES, B.Sc., DIP. AGRIC. Sc., A.I.C.T.A. (On active service 5/6/40—30/11/40).
		C. C. WEBSTER, B.Sc., A.I.C.T.A.
		H. W. T. WEBB, B.Sc., AGRIC. (McGILL.), A.I.C.T.A.
		C. J. DAWKINS, B.A., B.Sc. (Oxon.), B.A. (Cantab.), A.I.C.T.A. (On active service 4/7/40).
		M. F. H. SELBY, B.A., DIP. AGRIC. (Cantab.), A.I.C.T.A. (Appointed 27/8/40).
Temporary Agricultural Officer	...	H. V. NEWBY, B.Sc., N.D.A. (Agricultural School, Makwapala).
Asst. Agricultural Officer	...	A. B. CORMACK. (On active service 1939).
Temporary Agricultural Supervisors	...	A. C. WILLIAMSON, C.D.A.; D. N. SMALLEY; E. E. CARRALL-WILCOCKS; J. C. STIVEN; C. W. COOMBE; J. F. HENNING; J. E. L. FENNER (on active service 1939); G. D. HAYES (on active service 1/8/40); J. A. C. ANDERSON (Appointed 6/1/40); J. A. G. STENT (Appointed 15/5/40. On active service 5/6/40).

Empire Cotton Growing Corporation

Cotton Specialist	...	H. C. DUCKER, B.Sc., N.D.A.
Asst. Cotton Specialists	...	W. L. MILLER; S. T. HOYLE, B.A.
Insect Pest Control	...	E. O. PEARSON, B.A., A.I.C.T.A., F.R.E.S. B. L. MITCHELL, B.Sc., F.R.E.S.

Native Tobacco Board

Protectorate Tobacco Officer	...	R. M. ANTILL, M.C.
Agricultural Superintendent	...	R. E. JACKSON.
Supervisors	...	R. E. WILBRAHAM; J. HUNTER; J. A. MILLER; W. L. MAXWELL; J. C. ONIONS (returned from active service 1/2/40); D. THOMSON (appointed 14/5/40); G. C. DOW (retired 1/5/40); J. W. PRYOR (retired 1/7/40); J. W. BURTON (retired 1/8/40); J. R. FINDLAY (retired 1/9/40); M. S. HALL (on active service 30/5/40); F. I. SCOTT (on active service 4/7/40).
		On active service 1939:—F. F. SMITHYMAN; G. D. N. BARTLETT; J. W. GUISE; G. J. STACEY.
Junior Supervisors	...	L. N. RAYNOR (on active service 20/3/40); R. NASH (on active service 5/6/40); A. CARR (retired 1/5/40).

Combined Clerical Staff of Department of Agriculture and Native Tobacco Board

Secretary	...	J. A. CALLOW.
Clerks	...	R. NEIL; N. R. BARTLETT (on active service 1939); R. CAMPBELL (on active service 30/5/40).
Junior Clerks	...	A. E. COPPING; J. A. GRAY (retired 15/4/40).

Report of the Director of Agriculture

PART I.—AGRICULTURE IN NYASALAND

WEATHER CONDITIONS.

In general, rainfall was slightly above the average throughout the Protectorate. In the Southern Province well-distributed and early planting rains for the 1939-40 season were experienced and full use was made of them with resulting good crops and high yields. Heavy rains in March, however, caused river floods that destroyed the Chikwawa rice crop. The level of the Shire river at Port Herald was over 20' for more than half the year, the difference between the highest and lowest monthly mean levels being the smallest yet recorded at 2' 5 $\frac{3}{4}$ ". From 1934-36 this difference ranged from 12' to 14 $\frac{1}{2}$ ', the river level being well below 10' for more than six months each year.

In the Northern Province lack of sunshine in the early part of the season and some heavy falls of rain in February and March were detrimental to some plantings.

On the other hand conditions were satisfactory for the rain-grown cotton crop nearly everywhere.

The 1940-41 planting season was difficult. Early rains were local and dry conditions were experienced in many areas until well into the new year.

The total rainfall for the six wet months and six dry months are shown in the accompanying table.

Station	Zone	Total rainfall November 1, 1939, to April 30, 1940, Inches	Normal for six wet months Inches	Total rainfall May 1 to October 31, 1940, Inches	Normal for six dry months Inches
Port Herald Experimental					
Station ...	A	38.26	28.8	2.21	3.2
Chikwawa ...	...	29.64	29.7	5.56	2.3
Cholo ...	B	52.16	48.8	10.34	8.1
Makwasa ...	...	34.43	46.8	6.36	4.4
Mlanje ...	C	71.95	66.6	13.76	14.5
Chitakali ...	...	78.48	65.6	16.29	12.1
Thornwood ...	...	76.60	67.8	20.02	11.6
Ruo ...	...	64.99	53.7	14.48	6.3
Glenorchy ...	...	64.68	56.2	12.28	10.1
Lujeri ...	...	115.02	76.3	25.31	14.3
Nalipiri ...	D	65.61	51.9	12.72	11.0
Blantyre ...	E	49.86	39.9	2.88	3.3
Chiradzulu ...	...	58.36	40.0	4.01	2.5
Nasonia ...	G	42.68	36.9	7.18	1.9
Zomba Experimental					
Station ...	H	54.81	46.8	3.75	4.6
Zomba Plateau	...	80.73	—	12.22	—
Zomba Police					
Headquarters	...	45.74	41.9	2.41	1.8
Mwanza ...	K	43.78	37.2	5.35	.6
Liwonde ...	L	44.20	31.7	8.53	1.1
Namwera ...	M	37.36	42.2	1.99	.3
Chipunga ...	...	40.58	35.0	1.51	.8
Fort Johnston	N	31.08	29.4	.41	1.2
Ncheu ...	P	41.40	37.0	.84	.9
Likuni ...	S	32.42	32.9	.42	1.5
Lilongwe ...	...	30.52	32.7	.42	.8
Dowa ...	T	32.49	33.1	.66	.7
Fort Manning	...	42.39	39.8	4.54	2.5
Domira Bay ...	U	33.96	31.0	.26	.1
Dedza ...	V	45.44	39.7	1.77	2.2
Kasungu ...	X	38.09	29.1	.30	.3
Mzimba ...	...	40.67	31.7	.64	.2
Kota Kota ...	Y	62.72	48.2	2.09	2.0
Chinteché ...	Z	46.43	62.9	7.65	5.1
Karonga ...	...	53.11	52.3	1.35	2.8

PRODUCTION AND EXPORT.

European production and acreage of the principal crops during the year are given in the following table:

		Acres	Yields			Acres	Yields
Tea	...	18,527½	12,878,488 lb.	...	Sisal	1,439½	5,131 cwt.
Coffee	...	209	127 cwt.	...	Cotton (lint)	111½	235½ cwt.
Tobacco	...	8,974½	3,313,576 lb.	...	Rubber	1,310	1,543 cwt.

Native production and numbers of growers of the two principal crops, *viz.* cotton and tobacco, are as shown below:

	No. of growers	Amount sold
Cotton (seed cotton) ...	34,228	3,520 tons
Tobacco ...	56,933	6,038 tons

The exported amounts and values of the various items of agricultural produce and of raw materials were as follows.

	Amount	Value
		£
Chillies and Capsicums ...	20,912 lb.	261
Coffee ...	40 cwt.	93
Rice ...	424,674 lb.	1,896
Tobacco leaf dark-fired ...	5,506,716 lb.	202,106
leaf flue-cured ...	1,663,011 lb.	56,996
leaf air-cured ...	1,619,037 lb.	58,601
strips dark-fired ...	2,719,589 lb.	99,013
strips flue-cured ...	944,398 lb.	31,946
strips air-cured ...	941,260 lb.	34,504
Tea ...	12,794,314 lb.	481,688
Cotton (lint) ...	1,184 tons	38,693
Cotton (seed) ...	Nil	—
Fibre (all kinds) ...	243 tons	2,916
Groundnuts ...	119 tons	655
Potatoes ...	41,217 lb.	166
Soya Beans ...	674,410 lb.	1,204
Rubber ...	162,860 lb.	3,393
Strophanthus ...	19,408 lb.	1,941
Beeswax ...	19,067 lb.	795

In comparison with the previous year these figures show an increase in the export of twelve commodities and a decrease in the case of seven. There was a decrease of some 232,000 lbs. in the quantity of dark-fired tobacco leaf but an increase in all other types, the total export being nearly 907,000 lbs. greater than in 1939. The main decreases occurred in soya beans, groundnuts and cotton seed, no export of this last commodity being made during the year. Fibre (all kinds) was less than last year by 300 tons: the figure given against this product in the Annual Report for 1939 should have been stated in pounds, equivalent to 543 tons.

TOBACCO.

The season was not entirely a suitable one for the production of a crop with leaf of good body, owing to the February and March rains, and the native-grown crop displayed a general thinness and narrowing of leaf. The European flue crop was generally satisfactory, though that from Namwera was a little below its usual standard.

Native grown types showed an increase of more than 2,445,000 lbs. over the 1939 figures. The actual figures are:—

PRODUCTION.				lb.
<i>European</i>				
Flue-cured	...	...	...	3,018,792
Fire-cured	...	...	...	224,672
Air-cured	...	...	...	70,112
				<u>3,313,576</u>
<i>Native</i>				
Flue-cured	...	...	...	259,682
Fire-cured	...	...	...	10,100,442
Air-cured	...	...	...	3,184,945
				<u>13,545,069</u>
Total				<u>16,858,645</u>

EXPORTS.

	Amount lb.	Value £
Flue-cured	2,607,409	88,942
Fire-cured	8,226,805	301,119
Air-cured	2,560,297	93,105
	<u>13,394,011</u>	<u>483,166</u>

The number of registered Native Trust Land growers and the average amount of tobacco produced per grower were as follows:—

<i>Northern Province</i>				<i>Southern Province</i>			
34,769	...	186 lbs.	...	5,624	...	255 lbs.	...

The amount of tobacco purchased from growers on Native Trust Land and Private Estates respectively are shown below:—

	<i>Northern Province</i>		<i>Southern Province</i>	
	lb.		lb.	
Native Trust Land	6,459,632	...	1,185,858	...
Private Estates	4,477,922	...	1,421,657	...
	<u>10,937,554</u>	...	<u>2,607,515</u>	...

The quantities, to the nearest 1,000 lb., of the different types sold on the licensed auction floor at Limbe and the average prices were as follows:—

	Amount	Average Price
Fire-cured	6,968,000 lb.	5.53d.
Flue-cured	3,519,000 lb.	8.54d.
Air-cured	537,000 lb.	5.67d.

COTTON.

The number of growers in the whole Protectorate showed an increase of 17 per cent. over 1939. The increase occurred mainly in the Lower River and Central Shire areas and was some 33.6 per cent. throughout the Southern Province. In the Northern Province, however, with the exception of the North Nyasa district which showed an increase of nearly 66 per cent., there was a decrease in all districts and for the whole Province there was an 11 per cent. decline in the number of growers and production in this Province was some 220 tons less than in 1939. Lack of attention to gardens in the Ncheu, Dedza and Dowa districts was mainly responsible for this reduction as yields at the Domira Bay station of the Empire Cotton Growing Corporation were exceptionally high, the mean being 973 lbs. seed cotton per acre.

The season was admirable for growth and development in the Southern Province but bollworm attack was heavy and the early markets were disappointing. By the end of the season the estimate of 1,950 tons of seed cotton for the Lower River Trust Land crop was exceeded by 94 tons, and the total Trust Land production in the Province was 725 tons more than in 1939. The whole of this crop was obtained from rain-grown cotton, most of it being interplanted with maize or millet; owing to the high level maintained by the Shire river throughout the year there was no flood-land cotton crop.

Details of Trust Land and Private Estate seed cotton production by districts were as follows:

<i>Southern Province</i>			<i>Northern Province</i>		
Lower Shire	1,017 tons	...	Ncheu	49 tons	...
Chikwawa	1,230 "	...	Dedza	74 "	...
Cholo	102 "	...	Dowa	261 "	...
Mlanje	Nil	...	Kota Kota	149 "	...
Blantyre	12 "	...	North Nyasa	<u>364</u> "	...
Central Shire	182 "	...		897 "	...
Upper Shire	61 "	...			...
South Nyasa	19 "	...			...
	<u>2,623</u> "	...			...

The total of 3,520 tons of which private estates produced 506 tons shows an increase of approximately 23.0 per cent. on the previous year's figure.

Prices averaged 1.131d. for No. 1; .563d. for No. 2 and .272d. for No. 3.

The total sum paid out to Native Trust Land growers was £26,701.

The following table shows improvement over 1939 in yields and production factor mainly in the Lower River and North Nyasa areas:—

Area	Yield/acre lb.	Production factor per lb. seed cotton issued	% sold as No.1
Lower River ...	160	3.2	72.16
Blantyre and Central Shire ...	165	4.8	83.95
Central and Northern areas ...	231	5.0	86.36
North Nyasa ...	401	5.0	90.49

European—European production of seed cotton amounted to 11½ tons.

TEA.

The year was a good one for this crop until December, 1940, when lack of rain and high temperatures seriously reduced the yields on most estates, and in some cases the unusual position was recorded of the November yields exceeding those of December. Bushes, however, did not appear to suffer more than a temporary set-back. In Mlanje the labour position was on the whole more satisfactory than in 1939, but in Cholo the usual annual shortage was experienced. Very great progress has been made in the past few years on most, if not all, tea plantations in the matter of accommodation, feeding and medical attention of employees.

TUNG OIL.

Further plantings brought the total acreage under this crop, mainly *Aleurites montana*, to 4,877½ acres. Plantations are situated mainly in the Mlanje, Cholo, Blantyre and Zomba districts.

Oil extraction machinery capable of dealing with all of the present nut production of the country was imported during the year by one of the planting concerns.

MINOR CROPS.

Production, in tons, of some of the minor crops from certain districts is indicated in the following table:—

District.	CROP						
	Maize	Ground-nuts	Beans and Pulses	Wheat	English Potatoes	Simsim	Rice
Lower Shire ...	100 *	10	—	—	—	5	70
Chikwawa ...	—	15	—	—	—	3	30
Blantyre ...	—	—	—	10¾	80	2	—
Mlanje ...	2,448 *	—	—	—	—	—	—
Cholo ...	750 *	—	—	—	10	—	—
Chiradzulu ...	800 *	—	—	—	20	3	—
Zomba ...	—	—	—	—	50	2	—
Upper Shire ...	120 *	50	10	½	—	—	25
South Nyasa ...	—	2	—	—	—	—	2
Ncheu ...	141	7	6	—	—	3¾	—
Dedza ...	443	153	18	62½	35½	—	—
Kota-Kota ...	—	—	—	—	—	—	540
TOTALS ...	4,797	237	34	73¾	195½	18¾	667

* These amounts actually sold to non-native buyers.

Figures for Ncheu and Dedza are returns of crop sales other than between natives. The figure for rice from the Kota-Kota district is estimated from the amount of paddy bought by the Rice Society.

In addition considerable quantities of maize and groundnuts were purchased in Kasungu and Lilongwe districts for military purposes. The figures for English Potatoes in the Southern Province districts are based on estimated local consumption.

NATIVE FOOD CROPS.

Generally conditions were excellent for grains and pulses and most crops gave heavy yields. In some areas of the Southern Province there was a large surplus of maize, but in the Northern Province an unusual quantity of the new crop was eaten green because of the short supplies from the previous year.

Somewhat erratic rainfall in the most northerly districts adversely affected the later planted food crops, particularly beans, which were also damaged in the flowering stage by high winds and heavy rain in the Ncheu and Dedza districts.

Groundnuts suffered severely from Rosette disease throughout the country, being aggravated in many cases by late planting.

The area under millet, *Sorghum vulgare*, (vern. *mapira*) in the Lower River is regaining its former dimension which it held prior to the locust invasion of 1932-33, and sweet potato plantings are increasing in the lighter soils. Rice is being encouraged in this area.

An increased acreage under root crops is apparent in the South Nyasa district and cassava is expanding in North Nyasa.

Sesame production filled local market requirements and the acreage under this crop could, in the Southern Province at any rate, be increased considerably.

The food situation was generally satisfactory and it was possible, late in the season, to make the following local purchases for military requirements:—

Maize	883 tons
Beans and Groundnuts ...	89 "
Rice ...	39 "

PESTS AND DISEASES.

Locusts—With the possible exception of a mixed swarm of *Locusta* and *Nomadacris*, not properly confirmed, in the vicinity of the Nyika plateau in August and September, the only species occurring in the Protectorate was the red locust (*Nomadacris septemfasciata*, Serv.). The course of development was very similar to that in the 1938-39 season. Egg-laying (14th generation) began in mid-November 1939 in the south of the Protectorate and continued throughout December in most districts of the Southern Province, but it was only very light and scattered in the Northern Province where little further development occurred.

With the exception of the Chikwawa district, hopper bands (14th generation) were in the nature of thin and scattered "pockets" of hoppers and the number of bands was much less and their size much smaller than was anticipated.

Poison spraying was successfully carried out in parts of the Lower Shire, Chikwawa and Blantyre districts and much destruction by beating was accomplished elsewhere. In the central areas considerable mortality of young hoppers was caused by *Empusa grylli*. In general little damage was done to food crops, partly owing to their advanced growth at the time they were attacked.

On the whole only a few flying swarms (14th generation) developed in the Protectorate commencing at the end of February in the sparsely inhabited hills to the west of Port Herald and Chiromo. Normal movement followed, with quiescent periods during the cool months and a recrudescence of activity later in the year.

Egg-laying (15th generation) began in November in the Southern districts, and continued in December in the Ncheu and Dedza districts. Hatching started about 10th December in the Lower Shire district but the hopper bands were of small dimensions and poisoning and beating were employed immediately where possible. Further hatching on a more extensive scale occurred later, but the situation did not appear to be serious at the end of the year.

Crop Pests—The Pink Bollworm (*Platyedra gossypiella*, Saunders.) was found to be distributed, apparently, throughout the length of the Shire River valley. But in the western part of the Chikwawa district and in the Central and Upper areas of the valley it was by no means numerous and in some places was only found after prolonged search. The absolute necessity for an effective dead season in these areas in particular cannot, therefore, be over-emphasised and drastic action against uprooting defaulters should be taken by Native Authorities, which does not appear to be the case at present. In this connection the Provincial Agricultural Officer, Southern Province, reports: "Cotton uprooting was badly carried out this season and there were many defaulters in the Southern Province".

In the past much help has been received from District Commissioners in this matter but it is obvious that still more assistance is required from the Administration in order that satisfactory results may be obtained from weak or dilatory Native Authorities.

The work on Red Bollworm and Stainers carried out by the entomological staff of the Empire Cotton Growing Corporation is referred to in Part II.

No very serious outbreaks of insect pests were recorded during the year on the main crops, though the Gelatine Grub (*Niphadolepis alianta*, Karsch.) appeared in considerable numbers on one tea estate in Mlanje for the first time. In Cholo, however, this insect appeared to be coming under the control of a "wilt" disease. In some places Cowpeas were severely damaged by *Ootheca mutabilis*, Sahlb. and Buckwheat in the Lower River was destroyed by *Zonocerus elegans*, Thunb.

Crop Diseases—The cotton crop was extremely free from both Angular Leaf Spot and direct bacterial lesions on the bolls. Examination of stained material showed *Nematospira gossypii* and not *Bacterium malvacearum*, E.F.S. to be the causative agent this year.

Rosette disease of Groundnuts was serious throughout the Protectorate.

Witchweed (*Striga* sp.) attack on maize in the Southern Province was not serious, but was fairly prevalent on *Sorghum* in the Lower River.

A species of *Dothiorella*, possibly *D. ribis*, was found on a number of Tung estates associated with a branch and twig canker. This fungus has also been reported from America where not only is it the cause of canker but also a nut rot causing the nuts to turn brown and fall prematurely.

The fungus *Fusarium lateritium*, Ness, also seemed to be the cause of a stem canker.

ADVISORY BODIES AND POLICY.

The changing phases in the Agricultural economy created by the war, particularly after the fall of France and the entry of Italy, called for a continual review of the Agricultural policy, and, although many of our pre-war projects had to be temporarily abandoned or curtailed, the true prospective was never lost sight of and a balanced and co-ordinated policy was assured by the contact which was maintained between officials and un-officials through the medium of the Economic Council, and the various Advisory Committees which were supplementary to the normal pre-war institutions such as the Native Welfare Committee; the Agronomic Development Sub-committee; the Tobacco Control Board and other kindred Associations.

The declared policy of Government in connection with the general Agricultural development of the Protectorate was ultimately defined in Circular No. 17 issued on the 25th October. The first duty was to produce an abundant and cheap supply of all nutritious foods to ensure that the requirements of both the military and civil populations should be fully met, and to improve the general health of the native populations in order to increase their productive capacity and make more and more fit men available for a continued effort in all directions.

The second task was to maintain or increase the production of our economic crops in order to provide essential supplies for the United Kingdom and other Empire countries.

In giving effect to these measures the necessity for preserving and maintaining the fertility of the soil was kept in the forefront, and our energies were directed to achieve the objectives, not by an increase in acreage or an increase in the man power employed, but by improved cultural methods which necessitated an increased effort on the part of all individuals.

To give full effect to the above the Department was organised on a Provincial basis and the available European staff placed at key points in each province under the general supervision of the Provincial Agricultural Officer stationed at the headquarters of the Province. The services of the European officers of the Empire Cotton Growing Corporation and the Native Tobacco Board were co-opted and the senior officers of both these institutions were made responsible for advising the Provincial Agricultural Officers on all matters pertaining to the development of these Industries, and were given the title of Protectorate Cotton Officer and Protectorate Tobacco Officer respectively.

PART II—WORK OF THE DEPARTMENT.

The main staff changes are recorded in the Staff List at the beginning of this report and further details are given below.

The following proceeded on Active Service during the year:—

Agricultural Officers	...	...	...	3
Temporary Agricultural Supervisors	...	...	...	2
Native Tobacco Board Field Staff	...	...	...	4
Clerical Staff	...	...	...	1

With the return from military duties of Mr. A. P. S. Forbes, Agricultural Officer, in November and Mr. J. C. Onions, Native Tobacco Board Supervisor, in February, sixteen officers from the Department and the Native Tobacco Board were serving with the forces at the end of the year, the proportions being:—

Departmental Staff	...	...	...	28%
Temporary Agricultural Supervisors	...	...	...	30%
Native Tobacco Board Field Staff	...	...	...	50%
Clerical Staff	...	...	...	40%

Retirements during the year were:—

F. Barker, DIP. AGRIC. (Edin.)—Agricultural Officer, on completion of service.

Native Tobacco Board Supervisors	5
Clerical Staff	1

M. F. H. Selby, B.A., DIP. AGRIC. (Cantab.) A.I.C.T.A., arrived in August on first appointment as Agricultural Officer and was stationed at Port Herald in charge of the Lower Shire and Chikwawa districts.

Two temporary Agricultural Supervisors, one of whom joined the forces within a month, and one Native Tobacco Board Supervisor were appointed locally during the year.

In January, C. C. Webster, B.Sc., A.I.C.T.A., was posted to Cholo to begin experimental work on tung. In February, E. Lawrence, N.D.A., C.D.A., and R. W. Kettlewell, B.Sc., A.I.C.T.A., were appointed Provincial Agricultural Officers, Southern and Northern Province respectively. In March, H. V. Newby, B.Sc., N.D.A., was posted to Makwapala to organise the Agricultural School for African Instructors, and C. J. Dawkins, B.A., B.Sc., A.I.C.T.A., was seconded to the Nutrition Survey Unit at Chintembwe in his place. On the latter officer joining the forces the Unit had to be left, temporarily, without a full-time Agricultural Officer. The staff of the Empire Cotton Growing Corporation having been placed at the disposal of the Nyasaland Government, H. C. Ducker, B.Sc., N.D.A., took charge of the Northern Province when R. W. Kettlewell proceeded on active service in May, until September when H. W. T. Webb, B.Sc., Agric. (McGill.), A.I.C.T.A., took over the position of Provincial Agricultural Officer, Northern Province.

In August, H. C. Ducker and R. M. Antill, M.C., were designated Protectorate Cotton Officer and Protectorate Tobacco Officer, respectively.

The Assistant Chemist, Dr. I. W. M. Armstrong Black was fully employed until the end of October on work in connection with the Control of Food and Essential Supplies, the Food Control Committee and the Economic and Food Crops Committee.

Cotton—The Nyasaland section on cotton pests for the Cotton Pests and Diseases Handbook which is being sponsored by the Empire Cotton Growing Corporation was compiled by the Entomologist in collaboration with the Provincial Agricultural Officer, Southern Province, and the staff of the Corporation.

Tung—In August a free grant of £14,498 over a period of 10 years was made from the Colonial Development Fund for the establishment of a Tung experimental station. Mr. C. C. Webster had already been stationed in Cholo with a view to his carrying out such work as the facilities offered by planters on their estates permitted. On receipt of the grant 500 acres of land were purchased at Chisawanu, some 8 miles south of Limbe, and work at once commenced on preparing some of the land for experiments and designing a suitable lay out for the station complete with the necessary buildings. By the end of December approximately 30 acres had been cleared and planted with experiments but building work, other than the making of 320,000 bricks, could not be started until 1941. This officer, has in the interim been provided with free accommodation by the Honourable Mr. M. P. Barrow, Chairman, Nyasaland Tung Growers Association, whose generous assistance is highly appreciated.

Rice—The Kota Kota Rice Society, founded in 1938, continues to prosper and with the steady increase in rice production in the area which it serves its affairs are rapidly becoming a whole time occupation for a European manager. No action has yet been taken formally to constitute the Society on a legal basis and its activities are still largely controlled by officers of the Department but this matter is now receiving consideration and it is hoped to register the Society as a corporate body during the coming year.

Production in the Kota Kota area during 1940 reached the record figure of 905 short tons of paddy and it became necessary to enlarge the factory accommodation and equipment in order that this quantity could be handled expeditiously. A large new store was therefore erected and an aspirator and winnower were added to the machinery, thus increasing output by reducing the work previously performed by the single mill.

As in previous seasons the money required to purchase the paddy from the growers was advanced, on interest, by Government and repaid as the rice was sold, and the year's working provided a satisfactory profit which has been devoted to the reduction of capital debt.

The outlook for the future of the Society is healthy. During the season under review the demand for rice both within and without the Protectorate far exceeded supplies and the Society need have no fears that for some time to come its produce can find a ready market.

Agricultural School—The plans for the Agricultural School at Makwapala, delayed in 1939 by the outbreak of hostilities, came to fruition during the year. The School was placed under the control of Mr. H. V. Newby whose report is extracted below :—

“The object of the School is to supply the Department of Agriculture and the Native Tobacco Board with trained African Instructors who will gradually take the place of untrained natives at present employed. After completing the 2-years' course and passing the final examination, students will enter the African Civil Service.

Opening—The first session commenced on the 13th October. Out of a total of over 40 applicants interviewed, 26 were accepted for the probationary period.

Conditions of Entrance—Applicants must have passed Standard IV and should normally be between the ages of 20 and 25 years. They are accepted for a probationary period of 12 weeks, during which they receive both classroom and field instruction. At the end of this period they sit for the preliminary School Examination.

Instruction during the probationary period aims at a revision of certain school subjects (Arithmetic, English, Geography of Nyasaland) together with new instruction in Arithmetic (advanced), Mensuration (as applied to Agriculture), Levelling and Drainage, and Book-keeping. At the same time a practical basis for later instruction in the purely agricultural subjects is laid by the daily manual work which the students perform on the Makwapala farm; during the probationary period this work includes preparation of fields and seedbeds, sowing and after-care of the principal crops.

Preliminary School Examination, 1940-41 Session—Owing to the fact that new students did not all come in on the same date this year, it was decided to set this examination upon two different dates, for an earlier and a later group of students respectively. The first group of 13 were examined in December, 10 of whom reached the required standard and were enrolled for the full course.

Instruction—The Training Course will occupy two years. Daily field work and field demonstrations, both at Makwapala and in the surrounding districts (*i.e.*, among native villages and gardens) will have an important place throughout the course.

The teaching is arranged under the following sections: Soil; Crops; Animal Husbandry; Plant Life; Insect Life; Animal Physiology and Health; Hygiene in the home and village; Citizenship; Duties of an Agricultural Instructor; Rural Economy; Mensuration; Land Measurement and Levelling; Book-keeping; Handicrafts.

In December, classroom instruction was begun on Soil, Crops, Plant Life and Insect Life, to run concurrently with the courses on Mensuration, Levelling, Book-keeping and Arithmetic already begun in October. Practical work, field demonstrations and simple classroom experiments are arranged to correspond as far as possible with the teaching in progress. The response of the African student to this practical and experimental approach fully justifies the system. A simple micro-projector has been improvised from an old microscope, and the results obtained from this method of demonstrating simple biological facts to the African have been highly satisfactory.

On the farm, two 8-acre gardens have been laid out under experimental rotations designed to maintain soil fertility while providing a balanced food supply for an African family, with a small annual cash crop in addition. Thus, rotation A is a 4-course: Maize, with Pigeon Pea interplanted and compost applied; Pigeon Pea; Tobacco or Cotton; Maize with beans interplanted and compost applied. Small additional areas are provided for Groundnuts, Sweet Potatoes or Cassava, and Vegetables. In rotation B, the value of Elephant Grass to maintain and improve fertility, and as a preparation for Cotton, is being tested. This is a five-course rotation, during which the Elephant Grass is allowed to stand for two seasons; and food crops of maize and beans are taken. The value of such a rotation to the African will depend upon his adoption of a system of mixed farming, with a pair of oxen available for draft purposes.

In handicrafts, the students have been taught to make simple tools, and to construct beds and other simple articles of furniture from rough timber, bamboo, palm rope, etc. Simple iron and tin work, fibre-processing and rope-making will be included in this section.

Food—A balanced diet, following closely the recommendations published by the Medical Department, is supplied, comprising maize meal, rice, sweet potatoes, beans (various), groundnuts, fresh and dried fish, fresh vegetables and salt.

Housing—In the present session, students have been given temporary sleeping quarters in one half of the main School building. A plan to construct a School Village of suitable houses for students and their wives is in preparation. The houses will be planned simply, and will not be beyond the powers of any enterprising African to build for himself.

Future Developments—1. The system of dividing up the land at Makwapala into experimental family holdings will be extended, and the practice of mixed farming developed.

2. It is hoped to procure a Persian ram for cross-breeding with native ewes of good type.

3. A School Dairy will be established as soon as possible, to be run upon simple and practical lines, within the powers of an enterprising African.

4. Simple instruction in diet, cooking, poultry keeping and gardening, for the wives of students, is to be given with the assistance of an African instructress."

Marketing of Native Crops—On arrival in June the Marketing Officer spent some months in visiting the various producing districts and in investigating the need for controlled and organised marketing of the various products. The marketing of tobacco and cotton being already controlled, investigations were concerned mainly with maize, beans, groundnuts, rice and wheat. A scheme was prepared, ready for introduction in 1941, for the controlled marketing of these crops in such districts as had reached the stage of production at which such organisation was justified and required.

The Marketing Officer also assumed responsibility of the affairs of the Kota Kota Rice Society and in addition owing to difficulty in obtaining sufficient quantities through the medium of contractors because of the late period in the year when they were demanded, he had to organise a system of direct purchase from producers in order to supply the military camps with their requisite food supplies. Much detailed work was involved but the greater part of the military requirements were obtained before the end of the year.

At the direction of the Secretary of State a review of the auction system of cotton marketing was prepared by the Marketing Officer and submitted.

Consideration has been given to the development of a rice industry in the riverine areas of the two southernmost districts of the Protectorate on land previously devoted to the production of cotton but now rendered unsuitable for that purpose by flooding. In view of the desirability of standardising the production of a high quality rice and the need to offer some form of protection from uneconomic competition to whomsoever incurred the expense of erecting and equipping a factory, Government decided to invite applications for the grant of an Exclusive Licence for the purchase of paddy in these districts. The grant of such a licence, containing necessary safeguards and conditions, and valid for a period of five years or until a minimum production of 200 tons per annum is reached over a lesser period, was imminent when the year closed.

EXPERIMENTAL STATIONS.

Although none of the Departmental and Native Tobacco Board experimental stations and sub-stations were completely closed down, exigencies of the service rendered severe curtailment of experimental work essential and certain stations had to be placed on a care and maintenance basis.

Port Herald—Attempts at suppressing the flowering and fruiting of cotton sown at different dates by cutting back, stripping and inter-cropping with Pigeon Pea in order to avoid the main insect attack on the developing bolls were largely vitiated by the impossibility of siting the plots so that they would not be affected by the insect population bred up in surrounding native gardens. The indications, however, were that under the soil and climatic conditions of the station, cutting back is too drastic, hand-stripping uneconomic, and that Pigeon Pea smothered the cotton too severely.

The most important work on the station is that of restoring, maintaining and improving soil fertility, particular attention being paid to rotations, native methods of intercropping, restorative crops, green manures, grass fallows and compost manufacture of which just over 100 tons was made during the year.

Masambanji—Coffee is making little headway and it seems probable that conditions are no more suitable here for this crop than elsewhere in the country, and that the attention required to keep even a small plot of coffee in good heart is more than the African grower can give.

The Natal Queen Pineapple plots, however, have fruited extremely well and many hundreds of suckers have been distributed to Europeans and Africans.

Cuttings of *Derris elliptica* from Amani have been established though there were a number of deaths in the original material.

Zomba—Several changes at short notice of the Officer-in-Charge of this station had to be made during the year, and experimental work was therefore reduced to a minimum. One rotational and one manurial experiment on Western Zomba fire-cured tobacco were begun. The station is mainly used for bulking up seed stocks of a wide variety of crops and manufacture of compost. A supply of 780 lb. of Western Tobacco seed was produced for the Native Tobacco Board. Ten varieties of soya beans, several kinds of groundnuts and numerous different cereals, pasture grasses and anti-erosion crops were grown. A large number of banana suckers of good local types are issued annually to Africans in the neighbourhood, and supplies have been sent to other stations.

A considerable quantity of budwood of *Aleurites montana* was issued to planters and the following notes on the work carried out on Tung at this station are extracted from Mr. C. C. Webster's report:—

"During the 1939 flowering season 123 trees of *A. montana* were examined every few days and the percentage of female flowers was estimated. The figures obtained (Table 1) show that the trees tend to be either predominantly male or predominantly female, and that 48 trees (38.9%) had less than 5% of female flower and could therefore bear little fruit. The effect of the percentage of female flower on yield is clearly shown by the figures in the last column of Table 1 and by the yields of the past four years as given in Table 2. The 48 "male" trees have been consistently poor yielders over this period while, on the other hand, some trees have given exceptionally high yields every year.

Table 1. Classification of 123 trees at Zomba by percentage of female flower.

Percentage of female flower, 1939.	Number of trees		Percentage of trees		Mean yield per tree, 1940, lbs. dry seed.
0	...	4	...	3.2	0
0—5	...	44	...	35.7	2.6
5—30	...	2	...	1.6	12.7
30—70	...	9	...	7.3	23.9
70—95	...	31	...	25.2	20.1
95—100	...	38	...	27.0	22.2

Table 2. Yields of *Aleurites montana* trees at Zomba, lbs. dry seed per tree.

Year:	1937.		1938		1939		1940
Age, Years:	...	...	...	...	...	...	...
	5	...	6	...	7	...	8
Whole plot, 123 trees	...	...	...	...	...	...	...
48 trees with less than 5% female blossom	...	...	...	...	...	...	...
75 remaining trees	...	...	...	...	...	...	...
10 best yielders	...	...	...	...	...	...	...

The occurrence of approximately 40% of unprofitable male trees in plantations of *montana* established from unselected seed has been recorded from Indo-China and observed by the writer in other plantations in Nyasaland and in Burma, so that it appears to be general. This feature, and the variation in yield amongst the remaining trees, clearly offers great scope for selection and the production of improved planting material. The yield variation amongst *fordii* trees, although considerable, is not as pronounced as it is with *montana*, nor is there evidence of any appreciable proportion of the trees being unprofitable on account of being predominantly male, but there is of course, ample room for improvement by selection.

Topworking—Experiments carried out during the year indicate that budding or grafting on to the lateral branches of "male" *montana* trees when they are 3 or more years old may perhaps provide a means of rapidly converting these unprofitable trees into good yielders. Three trees at the Zomba Experimental Station, which had produced only male flowers for two years, were budded in this way in October, 1939, with scions taken from high yielding (predominantly female) trees. After cutting back the old branches the scions grew out strongly and produced shoots two or three feet long by the end of the growing season. These shoots flowered in September, 1940, producing only female flower and setting a small crop of fruit. On these trees the scions made strong unions with the old tree and the only failures which occurred were due to insects eating off the young bud shoots just after they had commenced growth."

Makwapa—Before this station was converted to the Agricultural School a few experiments were in progress, but again unavoidable changes in control during the past two years has made the keeping of accurate records extremely difficult.

In addition to a little work on tobacco, 60 lbs. of seed of different varieties were produced for the Native Tobacco Board.

Some results were obtained on the first year's working of two of the field experiments on maize which were laid down in 1939. The yields have been analysed and the conclusions which may be drawn are as follows:—

Expt. M.E.5.—Trial of six Maize varieties.

Sahara, Potchefstroom Pearl and Muratha were all equally good, Sahara just failing to give a significantly better yield than the other two. Sahara was significantly better than British Honduras, Peruvian Yellow and Durum, and there was no significant difference between the latter three varieties.

Expt. M.E.4.—Maize Trial: Spacing, Ridge versus Flat Planting, Interplanting.

An 18-inch spacing gave a significantly better yield (Potchefstroom Pearl) than a 2 foot spacing: but when interplanted with Groundnuts (bunch var.) the 2 foot spacing gave the better yield.

Ridging appears to give a better yield than flat planting but the difference was not significant.

Mlanje—The station is mainly concerned with work on tea and when the officer in charge joined the forces experimental work had to be abandoned and the station placed on a care and maintenance basis.

In June an extended pruning cycle policy was applied to the whole station and this coupled with an extraordinarily good tea season resulted in yield of made tea reaching the figure of 1,072 lbs. per acre over the whole station. As the tea was planted at the end of 1934 and the beginning of 1935 the yield is most satisfactory. With the increase of price for green leaf due to the long term contract and the Government allowance for increased costs shared equally by the producer and the manufacturer the income from the sale of produce more than covered the cost of not only the tea work but the other work undertaken by the station.

Chisavani—Opened late in the year as an experimental station for Tung, with Mr. C. C. Webster in charge, the work on this station is only just commencing but considerable information on a variety of matters has been obtained, and also from work on private estates. Certain results and observations have already been published in the Nyasaland Tea Association Quarterly Journal and it is proposed that the results of the experimental work now in progress should be published, as they become available, in the Nyasaland Agricultural Quarterly Journal.

The work being undertaken at the station includes:—

Production of improved planting material by selection of high yielding mother trees and their propagation by budding and other vegetative means; technique of transplanting budded stumps; cultural and manurial experiments; and methods of seed storage and germination.

Likuni and Chimvua—Experimental work was on a very reduced scale on both these stations, which are mainly used for supplying pure strains of tobacco seed for the dark-fired crop in the Northern Province.

Kota Kota—Observations on Burma, Madras and local rice varieties were carried out under wet and dry land conditions.

The Madras varieties gave a small fine husked grain which would have given a high percentage of No. 2 grade rice when milled with the screens in use at the mill. Yields were low. None of the varieties showed any qualities superior to *Faya* or the other local varieties.

The Burma varieties gave large coarse-husked grains. The percentage of broken grain and loss on milling was high. The Burma varieties were more promising than those from Madras.

The conclusion to be drawn is that the local *Faya* variety is best suited for the conditions of production. It is a non-glutinous rice suitable for export. Yields are satisfactory under local conditions and can be improved. Furthermore it is well established among the native growers and no other variety has been found to possess sufficiently superior qualities to justify large scale substitution.

Of the other local varieties *Jojo* is a heavy yielder, but is a glutinous rice and not suitable for export, and *Mwanangeni*, though a good yielder in drier areas, breaks badly on milling.

Nchena-chena—The cultural treatments on the coffee observation plots were continued, and the results again showed that heavy mulching has significantly the biggest and quickest effect compared with other treatments.

Assistance to a European planter in trials with *Pyrethrum* on the high altitude of the Nyika Plateau was given from this station.

An African Beekeeping Instructor, from the Department of Agriculture, Tanganyika Territory, gave a course of instruction on improved methods of beeswax production in May and June and several demonstrators were trained to carry on operations in these northern areas. Hundreds of improved type bee hives have been distributed.

Karonga—Owing to the amount of district work necessary in North Nyasa this station has now been put on a maintenance basis and functions mainly as a seed farm.

Nkwale—Empire Cotton Growing Corporation Experiment Station—The following extracts are taken from the 1939/40 Progress Report, which will appear in the usual manner. Reference is also made here to work on cotton in the Lower River areas.

"*Cotton*—The good rainfall distribution, combined with but slight insect attack, as a result of the plant sanitation measures carried out in the previous three years, allowed the crop to grow steadily without a check. The crop was the largest so far recorded by the station.

The mean yield was approximately 350 lb. lint per acre, actually 973 lb. seed cotton per acre of which some 95 per cent. was clean and white. One five acre field, which has been under cultivation for eleven years including two rest periods, and has had no manuring, was planted with a bulk of Z.14 and gave the high yield of 470 lb. lint per acre.

A small bulk strain trial, following the method of J. B. Hutchinson, with ten sub-strains each of "920", C.28, and some of the crosses was planted. As was general on the station yields were high, ranging from 310 to 530 lb. lint per acre.

It was again confirmed that the U.4 x Cambodia x U.4 cross is the highest yielder, Harland's version of this cross being the best with a locally made cross second. There was no significant difference in yield between the U.4 derivative "920" and C.28 and the other crosses in this trial.

A standard strain trial was planted with five recent introductions of U.4 origin from S. Rhodesia, two from Barberton, two locally selected strains of U.4, and the Nyasaland Upland strain S.G. 27. The latter is locally acclimatised, having been reselected for Jassid tolerance at Domira Bay over a period of eight years. There were no significant differences in yield between seven of the nine U.4 lots, but the S.G. 27, which closely resembles the old Nyasaland Upland formerly grown by European estates in the Shire Highlands, yielded less seed cotton and, owing to its low ginning percentage, much less lint than any of the U.4 strains.

An experiment was planted which was designed to discover if acid treatment of seed increased the yield, and if different strains would give different responses to such treatment. Four strains were used, two U.4 lots and two crosses. The final result was that the acid treated seed gave about 8 per cent. more than untreated seed and that there was no differential response among the strains.

In order to study the effects of seed rate and time of thinning these two factors were combined in one experiment. There were no significant differences in final yield. The lowest seed rate used, five seeds per hole, had many more blanks than the other seed rates, but not enough to affect the final result. This might not have been the case in a less favourable season.

Cultivation experiments were continued, this year in fields planted to groundnuts and cotton respectively. The experiment with cotton again showed that the most important effect was an increase of yield in the ridged plots compared with those planted on the flat. The dug plots were just better than the plots with no pre-cultivation.

No cotton plots occurred in this year's breaks of the rotation experiment, the whole area of which is due to be planted in cotton in 1941/42.

Elephant Grass—This is being used as an alternative cover crop to Pigeon Pea in the rotation experiment, and is giving good results to date. In view of the doubt which now obtains regarding the future of the pigeon pea crop at this station, an experiment was laid down to ascertain the best time and method of planting elephant grass. As far as it has gone at present it would appear that the grass may be planted under a maize cover in precisely the same way as pigeon pea, and that quite a wide spacing may be satisfactory.

A plant arrangement experiment in which cotton and maize, and cotton and groundnuts, were intercropped in various ways, showed decisively that cotton and groundnuts could not be satisfactorily combined under this season's conditions at Chiromo and suggested that the higher percentage of maize there was on the land the lower the yield of the cotton, even though the latter made its crop long after the maize had ripened and been removed."

The following extracts are taken from the Progress Report of the Insect Pest Control Staff Messrs. E. O. Pearson and B. L. Mitchell.

"The original intention as regards stainer work was to develop, by survey methods already used in South Africa, the study of the bionomics of stainer in the Lake Shore area, with the exception that eventually much of the fundamental work on internal boll disease and its chief vectors would be carried out in this region, against the background provided by such preliminary studies. Of recent years, however, the problems raised by insect pest damage to the Lower River crop have become extremely urgent and this, coupled with the incentive provided by the war to emphasise work on more immediate problems whose early solution might be of value as a war effort, led to a drastic change in our research policy.

It was decided that, first, the immediate requirement was for definite and comprehensive information as to the nature and extent of the crop loss due to pests and diseases in the Lower River and the measurement of all factors effecting this loss, in the hope that it might be possible to ameliorate these conditions, once they have been defined, by using such knowledge of the bollworm and internal boll disease problems as we already possess. Secondly, it was decided that where any conflict of time and energies arose between this survey work on the Lower River and that of a more general and long range research character, the former would have precedence.

THE LAKE SHORE AREA.

Insect Population Records—Routine records of bollworm and stainer populations were obtained from a number of fields on the Domira Bay station and also from native gardens in the main vegetational types of the Lake Shore area. The initial bollworm infestation, derived from moths emerging from pupae which had been in diapause since the previous season, was remarkably light and a very good crop was set before the first generation bred in the crop had begun to make its appearance at the end of March.

The main stainer immigration, composed almost entirely of *D. intermedius*, coincided with the start of boll opening in late April. Fifth instar nymphs appeared 2-3 weeks later and by June a massive population had been built up (17,000 *D. intermedius* 5th instar per acre), of which, however, only a fraction of the derived adults remained in the field, the remainder dispersing very soon after reaching the final moult. The peak population of adults was thus only 3,000 per acre.

Plant Development and Crop Loss—Crop development studies were carried out by means of tagging flowers and also by plant diagrams in which the position, time of formation and history of every fruiting point on the plant is recorded.

Fifty-seven per cent. of the crop was derived from buds produced in the last fortnight of February; 95 per cent. from the six weeks ending the 23rd March. The first 43 per cent. of the buds formed produced 90 per cent. of the crop. Of the four main types of crop loss, that of shedding due to unknown causes easily ranked highest in point of numbers, but it seems probable that this merely represents an effort on the part of the plant to maintain its liabilities at a level at which it can efficiently discharge them. 66 per cent. of the fruiting points are lost by shedding of this type.

Bollworm accounts for a loss of 19 per cent. of the total number of fruiting points, but the loss is largely made up of buds and bolls shed and as this shedding may be selective, it is possible that it does not represent a true loss of crop. This will only occur where bolls are damaged which are irreplaceable and which represent a genuine investment on the part of the plant.

Apparently we should look to that portion of the non-shedding boll population which is damaged in order to obtain a true conception of the sources of the crop loss—at any rate under the conditions experienced this season. These are illuminating. Bollworm only accounted for a loss of 10 per cent. Bacterial disease (direct attack) and immaturity each accounted for $3\frac{1}{2}$ per cent. Stainer accounted for 38 per cent. and was thus easily the largest source of loss. Nearly half the bolls which set gave rise to clean cotton.

Practically the whole of this stainer damage seems to have been done by the immigrant population, and it is a surprisingly high figure considering the not unduly large immigrant population. The F1 population of 5th instars, although large, did not appear until mid-May, by which time over 80 per cent. of the bolls which ultimately contributed to the crop were over six weeks old—the critical age after which stainer attack becomes relatively unimportant.

Red Bollworm Diapause—The central problem of the bollworm situation in this country is the pupal diapause, as it is upon this that the whole question of control ultimately hinges.

Emergence of pupae in 1939-40 confirmed the findings outlined in last year's report, namely that whereas pupation occurring in February, March, and April is mainly short term, moths emerging from 3-5 weeks later, from May onwards a large proportion of the pupae go into diapause and do not emerge as moths until the following December to March, or, in the case of the Lower River, as late as May.

In South Africa, on the other hand, emergence of pupae is complete by the end of December. In order to determine whether this difference is due to pre-conditioning in the larval stage, or to direct environmental stresses on the pupae themselves, an interchange of pupae was made with Barberton in the dry season of 1939. The Nyasaland pupae sent to South Africa behaved in the same way as the local Barberton pupae, whilst the Barberton pupae sent to Nyasaland behaved as local Nyasaland pupae. There is clearly some factor present in Nyasaland and absent from South Africa which suppresses the metabolism of the normally developing pupa and forces it into diapause. The most obvious factor is the climatic one: from September onwards temperatures rise and humidities fall steeply but it remains to be proved which of these factors is the dominant one. This point is being intensively explored.

Experiments in the Lake Shore area on depth of pupation show that this increases from a mean of 1" in March to 2½" in June. Direct sampling of cotton fields confirms that pupae are in the surface layer of soil; *about 2,000 per acre were found in diapause in November.*

THE LOWER RIVER.

Native recorders have been trained and established at four points in the Lower River, from which six distinct types of land, representing the greater part of the cotton growing area, have been sampled. In every region a number of native gardens have been selected and in these records have been made of Red Bollworm egg laying and larval populations, stainer population, flower and boll production and a weekly sample of mature bolls withdrawn on which determination of crop loss due to different causes have been made. Altogether 35 native gardens have been studied.

In order to obtain a more detailed dissection of the interaction of plant growth with insect populations and subsequent crop, very extensive tagging experiments were carried out on the Chiromo sub-station, covering the whole range of possible planting dates on dry land on the Lower River.

Methods were adopted to minimise insect interference from planting to planting. Only partial success was obtained, but the detailed analysis of all the factors concerned has enabled one to assess and thus to discount the effect of such interference. This was accomplished by complete records of insect populations and by the detailed examination of the fate of flowers tagged at fortnightly intervals throughout the season. Bolls developing from such flowers were examined at maturity and the damage due to bollworm, stainer, bacterial disease and unknown causes identified and graded. Upwards of 90,000 such individual case histories were recorded.

Comprehensive meteorological records were taken at all points at standard stations and also within the crop. Pupation cages have already been in use at the Chiromo sub-station on heavy non-flood land, and at Port Herald on sub-irrigated sandy alluvium, for two years; in the latter part of the present season the use of cages has been extended to the light, dry, sandy land of the Port Herald area and to the rich, friable loams of Chikwawa, in the extreme north of the Lower River. A distance temperature recorder has been installed at the Chiromo cages, with bulbs inserted at 1½" and 3" depth.

Analysis of the causes of crop loss in the samples of gardens examined shows that of the total number of bolls which survive to a size where they are susceptible of examination, 46 per cent. were a complete loss due to bollworm, 28 per cent. due to stainer and 2 per cent. due to other causes including direct bacterial lesions. Only 24 per cent. contributed to the crop. In addition, analysis of aborted material (*i.e.* bolls which shed or which are attacked so early in life that they never develop) showed that 76 per cent. of this loss was due to bollworm.

The following conclusions may be drawn from this season's observations and experiments. The critical factors determining the amount of bollworm damage are:

1. The size of the moth flight from diapausing pupae.
2. The amount of breeding up in very early plantings which may reinforce the latter part of the diapause flight to later plantings.
3. The extent to which moth activity from June onwards is reduced, initially by the lengthening pupal periods in the cool weather and subsequently by the increasing proportion of pupae going into diapause.

The same type of factors control the size of the stainer infestation:

1. The size of the initial immigration to the crop in May.
2. The extent to which these immigrants are capable of building up an F1 on early fruiting plants.
3. The extent to which cool season breeding is inhibited.

If, as seems probable, the insect activity from June onwards is actually controlled by climatic conditions then evidently great benefit would be derived by manipulating plant growth so that the main fruiting comes after this critical date. Further, there are substantial grounds for believing that were the whole of the commercial crop restricted in its planting dates, the dimensions of the pest population built up in the crop would be greatly reduced. Finally, there is the possibility of actively reducing the initial infestation of both pests. This involves the consideration of factors inducing and breaking up the pupal diapause in Red Bollworm and its susceptibility in this stage; studies on these points are at present being developed.

In the case of the initial stainer infestation, the wild host cycle is involved; here the possibility may cautiously be indicated that there is a weak link in the chain of hosts immediately connecting with cotton. The possibility will be explored in the coming season."

DISTRICT WORK.

Demonstration Plots—These small plots as described in the last report (para. 45, page 10) were continued, and fourteen were in existence in the Southern Province during the year. Some readjustment was found to be necessary, and one rather inaccessible plot has been closed down temporarily and four others put down to Elephant Grass for a year. In all demonstration plots the sole criterion is yield over a period of years, and the improvement of soil fertility and complete soil conservation direct and govern all cropping schemes and rotations.

Yields of maize and millets from these plots ranged from $\frac{1}{2}$ —1 ton per acre, always higher than in surrounding native gardens. In one case long-term Bulrush millets, *Pennisetum tamale* and *P. leonis*, taking five months to maturity, gave over three times the yield of the local variety, 1,100 lb. against 304 lb. per acre, but in another plot there was little difference between the two. Long-term millets are not really desired by the African grower in the Lower River districts, his requirement being a quick maturing grain which is available for food as early as possible in the new year.

Some trials were carried out with short-term sorghums from South Africa. Growth was good and yields fair but the grain was very susceptible to weevil attack and under present native storage methods would not keep for more than a week or two. The demand on the Lower River is not for a short term plant but for a grain which will keep in storage. Bulrush millet fulfils the place of the short term sorghum and keeps well in storage. One long-term sorghum, *Dembera*, which shows considerable resistance to insect attack, has been found and is being bulked up on the Lower River.

In the Northern Province, in accordance with policy, five demonstration plots in the Dedza and one in the Lilongwe district have been handed over to Native Authorities or selected Africans to run as their own gardens, subject to advice from departmental officers. In the Mzimba district the plots at present act as seed distribution centres but are being developed into small holdings for future management by Africans.

Small plots of groundnuts were planted just outside the entrance to each cotton market in an endeavour to demonstrate the value of close planting of this crop in preventing the development of Rosette disease. Considerable interest was taken in them but it is difficult to drive home the full value of this practice.

Soil Conservation—Progress in this matter, though slow, continues steadily. Throughout the Southern Province efforts have been made, with the co-operation of the Forestry Department, to substitute ridge for mound (*matutu*) cultivation. Where possible check ridges have been laid out by machine but the number of gardens dealt with in this way must obviously be limited. Cultivators have also been urged to leave a cover of natural vegetation in existing drainage channels to slow down the flow of storm water. These wholesale measures to check erosion in hilly districts have been carried out in certain areas of Zomba, Cholo, Blantyre and the Upper Shire districts, where the work has met with a very definite response. More concentrated work is being carried out in various parts of the Province. In the hill tracts of the Chikwawa district, opening new and extending old gardens is allowed only under permit stipulating that the new land is contour-bunded within a year of being opened and this scheme is now working smoothly. It is largely due to the work of the Native Agricultural Instructor, Type, son of chief Kajao, in this area, that the method has been efficiently developed.

Elsewhere ridge cultivation has largely replaced the *matutu* method and in N.A. Mpama's section of the Chiradzulu district approximately 5,000 gardens had, by the end of the year, been provided with permanent broad-based ridges or bunds.

In the Ncheu hill areas 924 acres of hill-side gardens have been contour bunded.

In Dedza district 42,392 acres have been contour ridged and 38,566 acres of gardens have been protected by storm drains. A considerable acreage has been contour bunded. (In the Annual Report, 1939, para. 46, page 10, the statement for Dedza district should have read:—"933 acres protected as above bringing the total to 3,433 acres ridged").

In other districts similar measures are being effected.

Combined with these mechanical checks to soil erosion cultural soil conservation practices are being advocated such as strip cropping, composting, manuring and crop rotations. These cultural measures although of greater real value in soil conservation are, unfortunately, less acceptable to the African than mechanical methods.

Land Settlement, etc.—In the Southern Province a second land settlement scheme on a reverted European estate in the Upper Shire district has been commenced. The land was divided into 6-acre blocks and by the end of the year a number of families had settled. In the Chipolopolo area, in the Lower Shire district, 45 blocks had been settled and opened up by the end of the year.

In the Northern Province the Sharpe Vale model native holding has been turned over to a selected Jeanes Worker who will manage it in future with the advice of the department, and there are two similar small holdings in the North Nyasa district.

Dowa Development Centre—The development of this valley catchment area in the Dowa hills continues successfully with the co-operation of the Forestry and Veterinary departments.

Development includes soil conservation measures, land reclamation and utilization by draining valley bottoms and canalizing stream beds, reafforestation and fire protection, as well as the adoption of ridge planting and improved agricultural practice.

Dedza Development Centre—Developments have followed along similar lines as the Dowa centre although on a smaller scale. A cattle kraal has been built, and a promising fruit tree nursery and vegetable garden has been opened up in a valley-bottom *dimba*.

Misuku (North Nyasa) Development Scheme—This was the third year of the comprehensive soil conservation and land development scheme, which continues very successfully under the direct control of the Agricultural Supervisor who has done very commendable work.

Forty-two villages over an area of four hundred square miles are now actively engaged in conserving and restoring the fertility of their land. Twelve thousand acres have been protected by soil conservation measures and four hundred miles of river and stream bank protection has been accomplished.

The introduction of suitable economic crops into this area is receiving active attention. Among those considered, wheat, oats and beeswax appear to be the most promising developments.

It is encouraging to report that the natives in this area are co-operating whole-heartedly in this scheme.

Miscellaneous—Nkhande Native Welfare Training Scheme—A three months course of instruction was given to some 20 prospective Native Agricultural Instructors by the Agricultural Officer, Ncheu, with a grant supplied from the Native Welfare Fund.

A general training in approved agricultural practice was given with particular emphasis on soil conservation methods. Instruction and demonstration consisted of lectures, practical manual work and field days. All the manual work on the station was done by the training *capitaos*.

Ten of the candidates completed the course successfully and were posted to various districts where they have since been engaged primarily on soil conservation work.

Pack-Animal Training—A native cattle trainer from Tanganyika has been instructing *capitaos* in the training of pack oxen. In North Nyasa although great efforts have been made to persuade the natives to adopt this form of transport little success has been attained. In spite of the fact that this form of transport would greatly facilitate the marketing of their cotton the natives appear to have an aversion to working their own cattle, apparently from tribal tradition.

In Dedza, however, pack-animal training is meeting with more success and oxen are being used for this purpose.

Seed Distribution, etc.—In the Neno hills practically every wheat garden was banded this season; *Sabanero* seed was sold very cheaply to growers on this condition. Excellent work was done by the Native Agricultural Instructor posted to this area and when a tour was made of the gardens in August nearly one hundred per cent. had been given almost complete protection from soil erosion. *Sabanero* seed was also given to a few growers on the Blantyre hills on similar conditions.

In the Lower Shire district selected *Pennisetum typhoideum* seed from the Port Herald Experimental Station was distributed to growers in exchange for an equal weight of their own seed. Pigeon pea seed was also given out and natives encouraged to plant it as a restorative crop.

Groundnut and pigeon pea seed was distributed free from most demonstration plots.

One Native Agricultural Instructor in the Lower Shire district was engaged during the whole season on tree planting. Small plantations of *Cassia siamea* have been established at over twenty villages.

In collaboration with the Assistant Conservator of Forests young trees for hut door planting have been distributed amongst natives in the Chikwawa, Blantyre and Central Shire districts.

A large nursery of rough lemon seedlings has been established on the Mlanje Tea Research Station ready for budding with orange and grape-fruit in 1941. The budded stock will then be distributed.

Rough lemon nurseries, for the same purpose, have been planted at Chirimba and Port Herald. Budding on to sour orange stocks is to be tried at Port Herald also.

Compost—Village pit compost manufacture has now been introduced to several areas in the Blantyre district. The quantities made were not large enough to warrant application to field crops on a large scale and have been used for the most part on fruit, such as pineapples, on vegetables and on a few rows of the maize gardens. A rough count of compost pits made at the end of the rainy season put the number in the Blantyre district at just under 1,000 and there has been a steady increase since. A *capitao* spends practically his whole time going round the pits seeing that they are turned and watered.

SOIL SCIENCE AND CHEMISTRY.

During the first ten months of the year miscellaneous chemical work was reduced to a minimum but throughout the year a certain amount of analytical and advisory work was carried out.

At the end of October the Assistant Chemist undertook an investigation of nicotine production by Nyasaland Tobacco Products, Ltd. at their Lilongwe factory, which was followed by an examination of the various products in the Zomba laboratory. The results of the investigations were conveyed to Government as a confidential report.

PART III.—SUMMARY OF LEGISLATIVE CHANGES.

The Tobacco Marketing Ordinance, 1937, was amended in order that the sale of scrap tobacco should take place only on the licensed auction floor.

The Tobacco Buyers (Auction Floor) Rules, (G.N. 50) and the Tobacco Marketing Tariff, (G.N. 54) were introduced.

Two minor amendments were made to the Tobacco Ordinance, 1926, and the Native Tobacco Board field staff were authorized to perform the duties of registration of growers on Trust Land in place of District Commissioners.

Under the Marketing of Native Produce Ordinance, 1938, Rules and a Form of Licence for the purchase of specified native produce were introduced and applied to the purchase of maize in the Mlanje and Cholo districts and of paddy in the Lower Shire and Chikwawa districts.

ACKNOWLEDGMENTS.

Throughout the year the Department had to assume ever-increasing responsibilities, and, although it is natural for all members of a community inspired by a common aim to get together in an endeavour to combat and overcome the many difficulties created by war conditions, I feel that I cannot close this brief review of the Department's activities without paying tribute to the whole-hearted co-operation and support received from the unofficial community in connection with the productive war effort, and to the zeal with which all officers of the Department carried out their duties in co-operation with officers of the Administration and other Departments. The work of the Forestry Department in connection with soil conservation measures is to be specially commended.

A. S. RICHARDSON,
Director of Agriculture.

EUROPEAN AGRICULTURE.

District.	Total acre- age under cultiv- ation. Acres.	TOBACCO.								TEA.		COFFEE.	
		Total.		Fire-cured.		Flue-cured.		Air-cured.		Acres under crop.	Yield cwt.	Acres under crop.	Yield cwt.
		Acres under crop.	Yield cwt.	Acres under crop.	Yield cwt.	Acres under crop.	Yield cwt.	Acres under crop.	Yield cwt.				
Lower Shire ..	137 $\frac{1}{2}$	10	60	10	60	...	...	...	...	...	...	...	...
Chikwawa ...	117	95	482	...	...	95	482	...	...	...	...	...	...
Central Shire ..	309	200	631 $\frac{1}{2}$	...	...	200	631 $\frac{1}{2}$	...	...	...	...	...	...
Cholo ...	18,950 $\frac{1}{2}$	2,151	7,628	...	...	2,151	7,628	...	...	9,273 $\frac{1}{2}$	44,842	...	...
Mlanje ...	11,100 $\frac{1}{2}$	660	2,066	30	190	610	1,812	20	64	9,254	70,144 $\frac{1}{2}$	36 $\frac{1}{2}$	49 $\frac{1}{2}$
Blantyre ...	2,548 $\frac{1}{2}$	1,759	5,502	...	...	1,759	5,502	...	...	...	...	71	42
Chiradzulu ...	582	403	1,447	80	112	296	1,217	27	118	...	...	...	...
Zomba ...	1,863	985 $\frac{1}{2}$	3,617 $\frac{1}{2}$	139	504	846	3,112 $\frac{1}{2}$	$\frac{1}{2}$	1	...	...	1 $\frac{1}{2}$	2
Upper Shire ...	264 $\frac{1}{2}$	74	234 $\frac{3}{4}$	...	...	59	174 $\frac{3}{4}$	15	60	...	...	...	...
South Nyasa ...	1,314 $\frac{3}{4}$	1,085	4,169	...	...	1,075	4,151	10	18	...	...	...	...
Ncheu ...	512 $\frac{1}{2}$	390	1,105	30	100	360	1,005	...	...	...	...	...	...
Dedza ...	212	115	530	...	...	115	530	...	...	...	...	...	1
Fort Manning ...	118	60	141	...	...	45	103	15	38	...	...	...	...
Lilongwe ...	631 $\frac{1}{2}$	273	952	40 $\frac{1}{2}$	200	136 $\frac{1}{2}$	492	96	260	...	...	...	...
Dowa ...	1,753 $\frac{1}{2}$	644	907	620	840	...	...	92	67	...	...	...	...
Kota Kota ...	71	...	...	...	...	...	...	...	...	...	...	...	2
Kasungu ...	11	...	...	...	...	...	...	...	...	...	...	...	...
Mzimba ...	113	...	...	...	...	...	...	...	...	...	...	8 $\frac{1}{2}$	2 $\frac{1}{2}$
West Nyasa ...	1,323	...	...	...	...	...	...	...	...	...	...	...	...
North Nyasa ...	120 $\frac{1}{2}$	70	113	...	...	70	113	...	...	...	...	16 $\frac{1}{2}$	28
Total ...	42,013 $\frac{1}{2}$	8,974 $\frac{1}{2}$	29,585 $\frac{1}{2}$	949 $\frac{1}{2}$	2,006	7,817 $\frac{1}{2}$	26,953 $\frac{1}{2}$	205 $\frac{1}{2}$	626	18,527 $\frac{1}{2}$	114,986 $\frac{1}{2}$	209	127

NOTE:—TEA: Acreage in plucking in 1940 was 16,296. COFFEE: Acreage in bearing in 1940 was 18,527.

EUROPEAN AGRICULTURE—CONTINUED.

District.	SISAL.		COTTON.		RUBBER.		CHILLIES AND CAPSICUMS.		MAIZE.		WHEAT.	
	Acres under crop.	Yield cwt.	Acres under crop.	Yield cwt.	Acres under crop.	Yield cwt.	Acres under crop.	Yield cwt.	Acres under crop.	Yield cwt.	Acres under crop.	Yield cwt.
Lower Shire ...	2	...	34 $\frac{1}{2}$	66	...	...	...	...	64 $\frac{1}{2}$	569	2	4
Chikwawa ...	...	...	...	...	...	...	...	...	2	20	5	...
Central Shire ...	...	...	...	...	...	...	...	...	...	...	...	...
Cholo ...	1,433	5,131	...	...	...	...	...	...	141	1,612	18	43
Mlanje ...	...	...	20	10	...	...	44	84 $\frac{1}{2}$	243	2,690	2	2
Blantyre ...	...	...	...	...	...	...	1	4	126	1,727	...	...
Chiradzulu ...	...	...	...	...	...	...	40	81	90	800	...	...
Zomba ...	4	...	...	...	...	...	...	...	189 $\frac{1}{2}$	1,666	11 $\frac{1}{2}$	20
Upper Shire ...	...	...	...	...	...	...	...	...	137	315	...	...
South Nyasa ...	...	...	...	...	...	...	...	...	121	1,727	...	...
Ncheu ...	...	...	2	3 $\frac{1}{2}$	...	...	...	...	100 $\frac{1}{2}$	652	1	...
Dedza ...	...	...	...	...	...	...	...	...	30	400	...	...
Fort Manning ...	...	...	...	...	...	...	...	...	2	4	1	3
Lilongwe ...	...	...	...	...	...	...	...	...	206 $\frac{1}{2}$	2,028	16 $\frac{1}{2}$	36
Dowa ...	...	...	55	156	...	...	...	...	376 $\frac{1}{2}$	5,524	1 $\frac{1}{2}$	10
Kota Kota ...	...	...	...	...	...	...	...	...	2	4	3	20
Kasungu ...	...	...	...	...	...	...	...	...	...	...	...	...
Mzimba ...	...	...	...	...	...	...	...	...	1 $\frac{1}{2}$	22	1	3
West Nyasa ...	...	...	...	...	1,310	1,543	...	...	10	100	...	...
North Nyasa ...	...	...	...	...	...	...	...	...	31	345	1	4
Total ...	1,439 $\frac{1}{2}$	5,131	111 $\frac{1}{2}$	235 $\frac{1}{2}$	1,310	1,543	85	169 $\frac{1}{2}$	1,873 $\frac{3}{4}$	20,205	63 $\frac{1}{2}$	145 $\frac{1}{2}$

EUROPEAN AGRICULTURE—CONTINUED.

Name of district.	LEGUMES.							OIL SEEDS.					
	Total.		For food.		For fodder.		For green manure.	Total.		For crushing.		For food.	
	Acres under crop.	Yield cwt.	Acres under crop.	Yield cwt.	Acres under crop.	Yield cwt.	Acres under crop.	Acres under crop.	Yield cwt.	Acres under crop.	Yield cwt.	Acres under crop.	Yield cwt.
Lower Shire ...	15	38	12½	38	...	...	2½	8	59	...	...	8	39
Chikwawa ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Central Shire ...	92	156	16	156	...	...	76	1	½	...	...	1	½
Cholo ...	1,186½	1,141½	117	449	8½	692	1,061	1,115½	8,216	1,115½	8,216	...	...
Mlanje ...	389	110	188	110	...	...	201	5	3	...	...	5	3
Blantyre ...	293½	1,132	54½	382	83	750	156	...	...	...	...	...	...
Chiradzulu ...	3	9	3	9	...	...	...	10	22	...	...	10	22
Zomba ...	324½	745½	149½	499	51	258½	124	34½	192½	29	172	5½	20½
Upper Shire ...	40	85	30	85	5	...	5	6	10	...	...	6	10
South Nyasa ...	163	...	...	...	...	...	163	...	...	...	...	...	...
Ncheu ...	11½	2	1½	2	...	...	...	2	5	...	...	2	5
Dedza ...	14	208	12	180	2	28	...	34	210	...	...	34	210
Fort Manning ...	36	50	6	50	...	...	30	...	...	...	...	...	...
Lilongwe ...	64½	314	46	293	5	21	13½	26	138	1	2	25	156
Dowa ...	55½	9	3½	9	...	...	52½	627½	954½	1½	5½	626	946
Kota Kota ...	½	2	½	2	...	...	...	...	...	...	...	...	...
Kasungu ...	1	10	1	10	...	...	...	½	5	...	...	1	5
Mzimba ...	...	...	...	...	...	...	...	2	20	...	...	2	20
West Nyasa ...	...	...	...	...	...	...	...	2	10	...	...	2	10
North Nyasa ...	2	20	2	20	...	...	...	...	...	...	...	...	...
Total ...	2,681½	4,031½	642½	2,294	154½	1,749½	1,884½	1,873½	9,845½	1,146½	8,395½	727	1,150

EUROPEAN AGRICULTURE—CONTINUED.

Name of district.	TUNG OIL.		FRUIT TREES.		NUT-BEARING TREES.		MISCELLANEOUS.		Woodland Artificially Established.
	Acres under crop.	Yield cwt.	Acres under crop.	Yield cwt.	Acres under crop.	Yield cwt.	Acres under crop.	Yield cwt.	Acres.
Lower Shire ...	...	...	1½	4	...	...	...	...	13
Chikwawa ...	...	...	5	12	...	...	10	20	7
Central Shire ...	...	...	16	64	...	...	...	...	22
Cholo ...	3,883	125½	110	308	3	...	6½	20	5,005
Mlanje ...	430	70¾	17½	635¾	...	...	...	...	3,422
Blantyre ...	272½	...	13½	13	...	...	17½	...	3,868
Chiradzulu ...	33	7	3	4	...	...	...	...	13 9
Zomba ...	222	54	14½	39	39	...	37	...	1,865
Upper Shire ...	½	...	7	24	...	...	...	...	40
South Nyasa ...	...	...	1	3½	...	...	...	...	480
Ncheu ...	...	...	15	40½	...	...	...	...	220
Dedza ...	¼	...	18½	181	½	...	...	...	272
Fort Manning ...	...	...	13	21	...	...	6	...	153
Lilongwe ...	18	...	26½	83	...	...	1½	...	2,561
Dowa ...	...	...	2¼	20	23½	...	...	...	233
Kota Kota ...	...	...	1½	15	...	...	...	...	23
Kasungu ...	...	...	3	5	...	...	...	...	7
Mzimba ...	17	...	3	9	...	...	6	...	105
West Nyasa ...	1	...	...	...	...	...	...	...	13
North Nyasa ...	...	...	...	...	...	...	...	...	13
Total ...	4,877½	257	270½	1,481¾	65½	...	84½	40	19,541

NATIVE AGRICULTURE.

District.	Seed Cotton	Rice	Wheat	Ground- nuts	Tobacco	Maize	Peas and Beans
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Lower Shire	1,017	70	...	10	...	...	...
Chikwawa	1,230	30	...	15	...	...	...
Central Shire	182	...	...	...	...	...	...
Cholo	102	...	...	...	25	...	...
Mlanje	...	...	...	...	471	...	...
Blantyre	12	...	10 $\frac{3}{4}$	...	39	...	...
Chiradzulu	...	...	...	...	245	...	...
Zomba	...	...	...	...	271	...	...
Upper Shire	61	25	$\frac{1}{2}$	50	108	...	...
South Nyasa	19	2	...	2	6	...	...
Ncheu	49	...	...	7	276	...	...
Dedza	74	22	63	153	166	...	...
Fort Manning	...	...	...	...	301	...	...
Lilongwe	...	...	...	73	3,007	...	...
Dowa	261	...	...	2	899	...	...
Kota Kota	149	605	...	...	170	...	...
Kasungu	...	...	...	9	54	...	...
Mzimba	...	...	8	...	...	...	...
West Nyasa	...	8	...	...	...	...	...
North Nyasa	355	42	...	40	...	...	...
Total	3,511	804	82 $\frac{1}{4}$	361	6,038	...	...

NOTE.—Maize is the staple foodstuff in most districts; groundnuts, rice, wheat, beans and various other crops are also grown by natives for local consumption, but it is impossible to make an accurate estimate of the quantities of these crops. The figures for rice, wheat and groundnuts are amounts actually sold in districts.

The above tobacco and cotton figures represent the quantities purchased in each district, and do not accurately reflect the production by districts, as many natives grow their tobacco and cotton in one district and sell in another.

LIVESTOCK OWNED BY NATIVES AT 31ST DECEMBER, 1940.

District.	Cattle.	Sheep.	Goats.	Pigs.
Lower Shire	292	2,377	8,608	6,088
Chikwawa	590	1,500	8,000	5,000
Central Shire	1,245	654	6,012	504
Cholo	101	706	3,002	3,021
Mlanje	1,974	3,047	11,775	2,983
Blantyre	2,872	3,814	9,603	5,877
Chiradzulu	4,200	1,420	10,850	9,800
Zomba	1,177*	1,804*	4,270*	1,454*
Upper Shire	112	2,600	4,600	90
South Nyasa	167	3,200	4,500	32
Ncheu	18,300	2,500	11,400	900
Dedza	28,652	Figures	not	known
Fort Manning	2,600	1,624*	9,994*	7,831*
Lilongwe	60,000	Figures	not	known
Dowa	20,000	5,000	30,000	2,000
Kota Kota	2,250	1,470	41,000	700
Kasungu	3,035	1,400	4,000	250
Mzimba	32,000	3,000	10,000	700
West Nyasa	2,192	136	1,105	—
North Nyasa	48,219	618	2,942	122
Total	229,978	36,870	181,661	47,352

* 1939 Figures.—1940 not known.

LIVE STOCK OWNED BY EUROPEANS AT 31ST DECEMBER, 1940.

District.	Cows and heifers.	Bulls.	Oxen.	Calves.	Pedigree cattle.	Horses.	Mules.	Donkeys.	Sheep.	Goats.	Pigs.
Lower Shire ...	470	14	123	223	—	—	—	29	108	40	31
Chikwawa ...	255	4	86	60	13	1	—	3	—	—	—
Central Shire ..	36	5	15	22	—	—	—	2	5	6	115
Cholo ...	1,473	42	782	702	13	32	1	3	253	46	—
Manje ...	4,338	29	663	592	6	1	—	1	96	13	65
Blantyre ...	1,060	19	477	460	52	9	—	9	—	7	453
Chiradzulu ...	502	5	163	255	9	2	—	—	2	—	37
Zomba ...	1,178	19	691	416	21	21	—	31	112	28	40
Upper Shire ...	6	1	3	—	—	—	—	—	—	60	42
South Nyasa ...	113	3	38	44	—	—	—	1	21	119	—
Ncheu ...	239	13	131	66	—	—	—	4	67	—	117
Dedza ...	196	8	174	75	—	—	—	4	—	15	81
Fort Manning	98	10	68	48	—	—	—	4	41	—	26
Lilongwe ...	253	13	253	125	—	3	—	40	25	4	160
Dowa ...	10	2	14	7	—	—	—	2	37	10	—
Kota Kota ...	29	1	15	20	—	—	—	1	15	1	—
Kasungu ...	—	—	—	—	—	—	—	—	1	—	5
Mzimba ...	15	1	26	6	—	—	—	2	36	—	18
West Nyasa ...	21	1	24	8	—	—	—	—	5	—	12
North Nyasa ...	115	3	106	49	—	—	—	—	81	—	60
Total ...	10,406	193	4,002	3,179	114	69	1	137	905	349	1,262

